REMARKS

Claims 1-4 have been examined, with all claims rejected based on prior art.

Claim Rejection - 35 USC 102

Claim 1 has been rejected under 35 U.S.C. 102(b) as being anticipated by Matsui et al. (JP2002-168719, using US 2004/0076498 as the English Translation). Applicant respectfully traverses this rejection for the reasons set forth below.

Claim 1 has been amended to make clear that the automatic correcting circuit is composed of an amplifier circuit to detect a leakage of charges and a switch for discharging the charges.

Matsui does not disclose, or even suggest, "an automatic correction circuit for detecting a leakage of the charges generated in a signal transmission system and for automatically correcting an output level of said signal converting circuit so that the output levels are the same at the start timing and at the end timing for generating the charges of the sensor," as required by claim 1. Moreover, Matsui does not disclose or suggest "an automatic correction circuit including an amplifier circuit for detecting a leakage of the charges ..., and including a switch ... to discharge an input charge of the signal converting circuit," as further required by claim 1.

The charge amplifier disclosed in Matsui detects the in-cylinder pressure of an internal combustion engine of an automobile to supply power from the battery of the plus power source such that, even if only the single power supply is provided to the operation amplifier, the pressure change both in the positive direction and in the negative direction with the offset voltage as the center is converted to a voltage signal. The result is a charge amplifier that does not require both the positive power supply and the negative power supply.

Matsui describes in paragraphs 0044-0045 that, the grounded one end of the sensor and the grounded end of the amplifier are electrically connected with a lead wire so as to have the ground potentials at the sensor side and at the amplifier side coincide with each other.

On the other hand, Matsui describes in paragraphs 0048-0049 that the insulation resistance of the piezoelectric type pressure sensor (i.e., the resistance between both ends of the piezoelectric type pressure sensor) lowers, thereby causing a leakage current, and the output signal of the amplifier adheres to the power supply voltage due to the influence of such a leakage current. In order to prevent this, a coupling capacitor is provided between the inversion input terminal of the operational amplifier and the terminal at the opposite side of the grounded terminal of the piezoelectric type pressure sensor.

However, the coupling capacitor described paragraphs 0048-0049 of Matsui prevents the amplitude of the amplifier output from becoming small due to the leakage current accompanying the lowering of the insulation resistance of the piezoelectric type pressure sensor. The coupling capacitor can not cope with the charge generated in the piezoelectric pressure sensor in part leaking from the signal transmission system to reach the input terminal of the amplifier so that the zero point of the amplifier output may drift.

In other words, if the pressure is measured with the piezoelectric type pressure sensor, when the pressure is raised from zero and again returned to zero, the charge of the sensor becomes negative by the amount that the charge has leaked. Thus, the zero point level of the signal output from the amplifier varies. In order to perform an accurate measurement, complex signal processing is needed at a subsequent stage.

In contrast to this, the present invention is applicable to both the amplifier which operates with the positive power supply and the negative power supply, and the amplifier which operates with the single power supply. By "detecting a leakage of the charges generated in the signal transmission system," the output level of the amplifier can be automatically corrected so that the output levels are the same at the start timing and at the end timing for generating the charges of the sensor. It therefore becomes possible to precisely measure the combustion waveform of the engine without any complex signal processing, and to reduce the load needed for the signal processing. Claim 1 is therefore patentable over Matsui.

Claim Rejection - 35 USC 103

Claims 2-4 have been rejected under 35 U.S.C. 103(a) as being unpatentable over Matsui et al in view of Hattori et al (U.S. Patent No. 4,095,876). Applicant respectfully traverses this rejection for the reasons set forth below.

The Examiner asserts that "Hattori discloses the suitability of a control system for discharging an input charge using an external signal (Column 4, lines 21-64)," and that "Hattori teaches the suitability of a control system for discharging an input charge using an external signal in a charge amplifier using a piezoelectric sensor for an internal combustion engine."

However, the subject matter of claims 2-4 of the present application not only simply discharge an input charge using an external signal, but makes it possible to simultaneously prevent the drift of the zero point due to the leakage of the charge and by the influence of temperature in association with the operation of an automatic correction circuit for detecting a leakage of the charges generated in a signal transmission system and for automatically correcting an output level of the amplifier so that the output levels are the same at the start timing and at the end timing for generating the charges of the sensor. Such functions and effects are unique to the subject matter of claims 2-4 by the associated operation, and neither disclosed nor suggested by Matsui or Hattori. Thus, claims 2-4 are patentable over Masui in view Hattori.

In view of the above, Applicant believes the pending application is in condition for allowance.

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Respectfully submitted,

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